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Applicant : Infineon Technologies AG   Art Unit : Unknown
Serial No. : Not yet assigned   Examiner : Unknown
Filed : Herewith
Title : DATA TRANSMISSION NETWORK

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PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the specification:

On page 1, line 10, insert --BACKGROUND--

On page 1, line 29, insert --SUMMARY--

Replace the paragraph beginning at page 1, line 30 with the following rewritten paragraph:

> -- It is a main object of the present invention to provide a data transmission
> network and a method for data transmission which allow xDSL data exchange
> and a voice data exchange on any data transmission medium and in particular
> on an ordinary POTS telephone line. (POTS: Plain Old Telephone Service). --

Delete the paragraph beginning at page 2, line 1.

Replace the paragraph beginning at page 5, line 10 with the following rewritten paragraph:

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-- In a preferred embodiment, the xDSL transceiver of the line termination device and the network termination devices are VDSL transceivers. --

Replace the paragraph beginning at page 6, line 12 with the following rewritten paragraph:

-- In the following, preferred embodiments of the data transmission network and the data transmission method according to the present invention are described in detail with respect to the enclosed Figures. --

On page 6, line 16, insert --BRIEF DESCRIPTION OF THE DRAWINGS--

Replace the paragraph beginning at page 7, line 1 with the following rewritten paragraph:
-- Figs. 7a, 7b show a request message and a grant message in principle; --

On page 7, line 9, insert --DETAILED DESCRIPTION--

Replace the paragraph beginning at page 9, line 32 with the following rewritten paragraph:

-- The high-pass filters 12 are connected via lines 17 to a combiner 18 which adds up the received high-pass filtered signals. The combiner 18 is connected via line 19 to a line termination device 2. The line termination device 2 is connected via line 3 to a main switch 4 which is connected via line 5 to an IP backbone 6. In the data transmission network having the topology as shown in Fig. 3, a multi-port POTS/xDSL splitter comprising the plurality of low-pass filters 10 and high-pass filters 12 is provided. The splitter filters the telephone signal on one side and filters the xDSL signal on the other side. --

Replace the paragraph beginning at page 10, line 10 with the following rewritten paragraph:

-- The line termination device 2 comprises an xDSL transceiver 20 for broadcasting downstream data frames to several network termination devices 8-I via the data transmission medium 7 and for receiving upstream data frames

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from the network termination devices 8-I via the data transmission medium 7. The data medium 7 is e.g. an unshielded twisted pair telephone line UTP made of copper. The xDSL transceiver 20 within the line termination device 2 comprises a line driver 21 for driving the received signals and for driving signals to be transmitted. The line driver 21 is connected via a line 22 to a hybrid circuit 23 which applies the received data signals via a line 24 to an analog receiving filter 25 which is connected on the output side via a line 26 to an amplifier unit 27 for amplifying the received and filtered data signals. The amplified received signal is supplied via line 28 to an analog/digital converter 29 which converts the received analog signal to a digital signal. The received digital signal is supplied via lines 30, 31 to an automatic gain control circuit 32 controlling the amplifier 27 via a control line 33 and to a digital QAM demodulator 34. The QAM demodulator is connected on its output side via a line 35 to a digital receiving filter 36 for suppressing noise. The digital filter 36 is connected via line 37 to an equalizer 38 for compensating distortions. The equalizer 38 is connected via line 39 to a slicer 40 for determining the received data symbols. The slicer 40 is connected via line 41 to a QAM decoder 42 which generates from the detected data symbols the corresponding data bits to be packed in a data frame. The QAM decoder 42 is connected via line 43 to a TC deframer 44 which is connected via line 45 to a deframer 46, e.g. an Ethernet deframer. The TC deframer 44 distracts messages from the received upstream data frames and supplies them via a line 47 to an NT status memory 48. The deframer 46 is connected via line 49 to an MII interface 50 for connecting the line termination device 2 via a line 3 to a switch 4. --

Replace the paragraph beginning at page 13, line 19 with the following rewritten paragraph:

-- The network termination device 8 comprises an xDSL transceiver 20 having a similar structure as the xDSL transceiver 20 in the line termination device.

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Additionally the network termination device 8 comprises a timing circuit 78 for tracking the timing of the clock signal of the line termination device 2. The timing circuit 78 is provided for synchronizing on the line termination device master clock. The timing circuit 78 is connected via line 79 through a voltage controller circuit 80 controlling a voltage controlled oscillator 81 via control line 82, the voltage controlled oscillator 81 generating an internal clock signal for the network termination device. --

Replace the paragraph beginning at page 14, line 7 with the following rewritten paragraph:

-- In the transmitting path of the xDSL transceiver 20 of the network termination device 8 there is provided an additional switch 85 controlled by a grant decoder 86 via a control line 87. When sending data information, switch 85 is closed. The request message generator 83 generates a data transmission request message when the data communication device 9 connected to the network termination device 8 contains a buffer memory for buffering data sent from the data communication device 9 when a request for data communication is not granted by the line termination device 2 immediately. --

Replace the paragraph beginning at page 17, line 28 with the following rewritten paragraph:

-- The line termination device 2 comprises an xDSL transceiver having a MAC functionality and acts as the master of the point to multi-point data link. The line termination device 2 schedules each network termination device 8 on a TDD basis. In a European or Asian network topology, a passive signal splitter is provided in order to combine the xDSL signal of different users on one copper line. --

Replace the paragraph beginning at page 18 line 1 with the following rewritten paragraph:

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-- The network termination device 8 comprises an xDSL transceiver transmitting data according to the request received from the master, i.e. a line termination device 2. --

In the claims:

Amend claims 1-26, as follows:

-- 1.   Data transmission network having

at least one line termination device connected via a data transmission medium to several network termination devices, each network termination device comprising

a request message generator for generating a data transmission request message when a data communication device connected to the network termination device is sending data, and

an xDSL transceiver for transmitting an upstream data frame including the generated request message via the data transmission medium to the line termination device,

said line termination device comprising

a selection unit for selecting network termination devices which have sent a request message depending on stored status information data of the network termination devices,

a grant message generator for generating data transmission grant messages for the selected network termination devices, and

an xDSL transceiver for broadcasting downstream data frames including the generated grant messages via the data transmission medium to the network termination devices.

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2. Data transmission network according to claim 1, wherein the transmission medium is a telephone line.

3. Data transmission network according to claim 1, wherein a data transmission request message comprises

> a request message opcode and a number of time slots required for data transmission of the data sent by the data communication device.

4. Data transmission network according to claim 1, wherein a data transmission grant message comprises

> a grant message opcode, and

> an address of the selected network termination device.

5. Data transmission network according to claim 1, wherein

> the upstream data frames are sent from the network termination devices to the line termination device via the data transmission medium in an upstream frequency band, and

> the downstream data frames are sent from the line termination device to the network termination device via the data transmission medium in a downstream frequency band.

6. Data transmission network according to claim 1, wherein

> the downstream frequency band ranges between 1 and 3 MHz and

> the upstream frequency band ranges between 4 and 8 MHz.

7. Data transmission network according to claim 1, wherein each line termination device comprises an MII interface for the connection to a switch.

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8. Data transmission network according to claim **1**, wherein each data frame comprises:

a synchronization data field,

a message data field,

a payload data field, and

an error correction data field.

9. Data transmission network according to claim **1**, wherein each network termination device is connected to a passive signal splitter.

10. Data transmission network according to claim **9**, wherein the passive signal splitter comprises

a low-pass filter for filtering a telephone signal, and

a high-pass filter for filtering an xDSL data signal.

11. Data transmission network according to claim **1**, wherein the line termination device comprises

storing means for storing the status information data of the different network termination devices connected to the line termination device.

12. Data transmission network according to claim **11**, wherein the storing means stores the addresses of the network termination devices and the corresponding numbers of the required time slots received from the network termination devices in request messages.

13. Data transmission network according to claim **1**, wherein the selection unit

reads the status information data stored in the storing means,

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selects the network termination devices for data transmission according to a programmed selection algorithm, and

activates the grant message generator for generating grant messages for the selected network termination devices.

14.   Data transmission network according to claim 1, wherein the xDSL transceiver of the line termination device includes an adaptive automatic gain control circuit and an equalizer.

15.   Data transmission network according to claim 1, wherein the line termination device comprises

a first storing means for storing the AGC coefficients for the network termination devices connected to the line termination device, and

a second storing means for storing equalizer coefficients for the network termination devices connected to the line termination device.

16.   Data transmission network according to claim 1, wherein the AGC coefficients of the selected network termination device selected by the selecting unit are loaded into the AGC circuit of the xDSL transceiver of the line termination device.

17.   Data transmission network according to claim 15, wherein the equalizer coefficients of the selected network termination device selected by the selecting unit are loaded into the equalizer of the xDSL transceiver of the line termination device.

18.   Data transmission network according to claim 1, wherein the network termination device comprises a grant decoder for decoding messages within downstream data frames broadcasted by the line termination device.

19.   Data transmission network according to claim 1, wherein the xDSL transceivers

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are VDSL transceivers.

20.   Data transmission network according to claim **1**, wherein the impedances of the network termination devices connected to the data transmission medium are balanced.

21.   Data transmission network according to claim **1**, wherein eight network termination devices are connected via the data transmission medium to the line termination device.

22.   Data transmission network according to claim **1**, wherein several line termination devices are connected to a switch.

23.   Data transmission network according to claim **22**, wherein the switch is connected to an IP backbone.

24.   Method for data transmission comprising:

> generating a data transmission request message by a network termination device when the network termination device receives data from a connected data communication device;

> transmitting the generated data transmission request message within an upstream data frame via a data transmission medium to a line termination device;

> selecting the network termination devices depending on stored status information data of the network termination devices;

> generating data transmission grant messages for the selected network termination devices by the line termination device;

> broadcasting downstream data frames containing the generated grant messages via the data transmission medium to the connected network

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termination devices; and

transmitting data from the selected network termination device after the grant message has been decoded.

25. Line termination device comprising

a selection unit for selecting a network termination device from a group of network termination devices connected to the line termination device in response to a request message depending on stored status information data of the network termination devices;

a grant message generator for generating data transmission grant messages for the selected network termination device, and

an xDSL transceiver for broadcasting downstream data frames including the generated grant messages via a data transmission medium to the network termination devices.

26. Network termination device comprising

a request message generator for generating a data transmission request message when a data communication device connected to the network termination device is sending data, and

an xDSL transceiver for transmitting an upstream data frame including the generated request message via the data transmission medium to a connected line termination device. --

In the abstract:

Replace the abstract with the following version.

-- Data transmission network having a least one line termination device connected via a data transmission medium to several network termination

devices, each network termination device comprising a request message
generator for generating a data transmission request message when a data
communication device connected to the network termination device is
sending data, and an xDSL transceiver for transmitting an upstream data
frame including the generated request message via the data transmission
medium to the line termination device. The line termination device
includes a selection unit for selecting network termination devices which
have sent a request message depending on stored status information data
of the network termination devices, a grant message generator for
generating data transmission grant messages for the selected network
termination devices, and an xDSL transceiver for broadcasting
downstream data frames including the generated grant messages via the
data transmission medium to the network termination devices. --

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REMARKS

Applicant amends the application to correct minor typographical errors.
Applicant amends the claims to eliminate multiple dependencies and to more clearly articulate the subject matter of the invention. No new matter has been introduced.

Attached is a marked-up version of the changes being made by the current amendment.

Applicant asks that all claims be examined. Enclosed is a check for excess claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 6/26/01

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Version with markings to show changes made

In the specification:

Paragraph beginning at page 1, line 30 has been amended as follows:

-- It is a main object of the present invention to provide a data transmission
network and a method for data transmission which allow xDSL data exchange and
a voice data exchange on any data transmission medium and in particular on an
ordinary POTS telephone line. (POTS: Plain Old [Play-all] Telephone Service). --

Paragraph beginning at page 2, line 1 has been deleted

Paragraph beginning at page 5, line 10 has been amended as follows:

-- In a preferred embodiment, the xDSL transceiver of the line termination
device and the network termination devices are VDSL transceivers. --

Replace the paragraph beginning at page 6, line 12 with the following rewritten
paragraph:

-- In the following, preferred embodiments of the data transmission network
and the data transmission method according to the present invention are
described in detail with respect to the enclosed Figures. --

Replace the paragraph beginning at page 7, line 1 with the following rewritten paragraph:

-- Figs. 7a, 7b show a request message and a grant message in principle; --

Replace the paragraph beginning at page 9, line 32 with the following rewritten
paragraph:

-- The high-pass filters 12 are connected via lines 17 to a combiner 18 which
adds up the received high-pass filtered signals. The combiner 18 is connected
via line 19 to a line termination device 2. The line termination device 2 is
connected via line 3 to a main switch 4 which is connected via line 5 to an IP
backbone 6. In the data transmission network having the topology as shown

in Fig. 3, a multi-port POTS/xDSL splitter comprising the plurality of low-pass filters 10 and high-pass filters 12 is provided. The splitter filters the telephone signal on one side and filters the xDSL signal on the other side. --

Replace the paragraph beginning at page 10, line 10 with the following rewritten paragraph:

-- The line termination device 2 comprises an xDSL transceiver 20 for broadcasting downstream data frames to several network termination devices 8-I via the data transmission medium 7 and for receiving upstream data frames from the network termination devices 8-I via the data transmission medium 7. The data medium 7 is e.g. an unshielded twisted pair telephone line UTP made of copper. The xDSL transceiver 20 within the line termination device 2 comprises a line driver 21 for driving the received signals and for driving signals to be transmitted. The line driver 21 is connected via a line 22 to a hybrid circuit 23 which applies the received data signals via a line 24 to an analog receiving filter 25 which is connected on the output side via a line 26 to an amplifier unit 27 for amplifying the received and filtered data signals. The amplified received signal is supplied via line 28 to an analog/digital converter 29 which converts the received analog signal to a digital signal. The received digital signal is supplied via lines 30, 1 to an automatic gain control circuit 32 controlling the amplifier 27 via a control line 33 and to a digital QAM demodulator 34. The QAM demodulator is connected on its output side via a line 35 to a digital receiving filter 36 for suppressing noise. The digital filter 36 is connected via line 37 to an equalizer 38 for compensating distortions. The equalizer 38 is connected via line 39 to a slicer 40 for determining the received data symbols. The slicer 40 is connected via line 41 to a QAM decoder 42 which generates from the detected data symbols the corresponding data bits to be packed in a data frame. The QAM decoder 42 is connected via line 43 to a TC deframer 44 [the TC deframer] which is connected via line 45 to a[n] deframer 46, e.g. an Ethernet deframer. The TC deframer 44 distracts messages from the received upstream data frames and supplies them via

a line 47 to an NT status memory 48. The deframer 46 is connected via line 49 to

an MII interface 50 for connecting the line termination device 2 via a line 3 to a

switch 4. --

Replace the paragraph beginning at page 13, line 19 with the following rewritten

paragraph:

-- The network termination device 8 comprises an xDSL transceiver 20 having

[the] a similar structure as the xDSL transceiver 20 in the line termination

device. Additionally the network termination device 8 comprises a timing

circuit 78 for tracking the timing of the clock signal of the line termination

device 2. The timing circuit 78 is provided for synchronizing on the line

termination device master clock. The timing circuit 78 is connected via line

79 through a voltage controller circuit 80 controlling a voltage controlled

oscillator 81 via control line 82, [said] the voltage controlled oscillator 81

generating an internal clock signal for the network termination device. --

Replace the paragraph beginning at page 14, line 7 with the following rewritten

paragraph:

-- In the transmitting path of the xDSL transceiver 20 of the network

termination device 8 there is provided an additional switch 85 controlled by a

grant decoder 86 via a control line 87. When sending data information, switch

85 is closed. The request message generator 83 generates a data transmission

request message when the data communication device 9 connected to the

network termination device 8 contains a buffer memory for buffering data sent

from the data communication device 9 when a request for data communication

is not granted by the line termination device 2 immediately. --

Replace the paragraph beginning at page 17, line 28 with the following rewritten

paragraph:

-- The line termination device 2 comprises [of] an xDSL transceiver having a

MAC functionality and acts as the master of the point to multi-point data link.

The line termination device 2 schedules each network termination device 8 on a TDD basis. In a European or Asian network topology, a passive signal splitter is provided in order to combine the xDSL signal of different users [to] on one copper line. --

Replace the paragraph beginning at page 18 line 1 with the following rewritten paragraph:

-- The network termination device 8 comprises [of] an xDSL transceiver transmitting data according to the request received from the master, i.e. a line termination device 2. --

In the claims:

Claims 1-26 been amended as follows:

1.   Data transmission network having

at least one line termination device [(2)] connected via a data transmission medium [(7)] to several network termination devices [(8)], each network termination device [(8)] comprising

a request message generator [(33)] for generating a data transmission request message when a data communication device [(9)] connected to the network termination device [(8)] is sending data, and

an xDSL transceiver [(20)] for transmitting an upstream data frame including the generated request message via the data transmission medium [(7)] to the line termination device [(2)],

said line termination device [(2)] comprising

a selection unit [(66)] for selecting network termination devices [(8)] which have sent a request message depending on stored status information data of the network termination devices [(8)],

a grant message generator [(68)] for generating data transmission grant

messages for the selected network termination devices [(8)], and

an xDSL transceiver [(20)] for broadcasting downstream data frames

including the generated grant messages via the data transmission

medium [(7)] to the network termination devices [(8)].

2.   Data transmission network according to claim 1, wherein the transmission

medium is a telephone line.

3.   Data transmission network according to claim 1 [or 2], wherein a data

transmission request message comprises

a request message opcode and a number of time slots required for data

transmission of the data sent by the data communication device [(9)].

4.   Data transmission network according to claim 1 [one of the preceding claims],

wherein a data transmission grant message comprises

a grant message opcode, and

an address of the selected network termination device.

5.   Data transmission network according to claim 1 [one of the preceding claims],

wherein

the upstream data frames are sent from the network termination devices

[(8)] to the line termination device [(2)] via the data transmission

medium [(7)] in an upstream frequency band, and

the downstream data frames are sent from the line termination device

[(2)] to the network termination device [(8)] via the data transmission

medium [(7)] in a downstream frequency band.

6.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~],

       wherein

       the downstream frequency band ranges between 1 and 3 MHz and

       the upstream frequency band ranges between 4 and 8 MHz.

7.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~],
       wherein each line termination device [~~(2)~~] comprises an MII interface [~~(50)~~] for
       the connection to a switch [~~(4)~~].

8.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~],
       wherein each data frame comprises:

       a synchronization data field,

       a message data field,

       a payload data field, and

       an error correction data field.

9.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~],
       wherein each network termination device [~~(8)~~] is connected to a passive signal
       splitter.

10.   Data transmission network according to <u>claim 9</u> [~~one of the preceding claims~~],
       wherein the passive signal splitter comprises

       a low-pass filter [~~(19-i)~~] for filtering a telephone signal, and

       a high-pass filter [~~(12-i)~~] for filtering an xDSL data signal.

11.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~],
       wherein the line termination device [~~(2)~~] comprises

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storing means [(48)] for storing the status information data of the
different network termination devices [(8)] connected to the line
termination device [(2)].

12. Data transmission network according to claim 11 [one of the preceding claims],
wherein the storing means [(48)] stores the addresses of the network termination
devices [(8)] and the corresponding numbers of the required time slots received
from the network termination devices [(8)] in request messages.

13. Data transmission network according to claim 1 [one of the preceding claims],
wherein the selection unit [(66)]

reads the status information data stored in the storing means [(48)],

selects the network termination devices for data transmission according to
a programmed selection algorithm, and

activates the grant message generator [(68)] for generating grant
messages for the selected network termination devices [(8)].

14. Data transmission network according to claim 1 [one of the preceding claims],
wherein the xDSL transceiver [(20)] of the line termination device [(2)] includes
an adaptive automatic gain control circuit [(32)] and an equalizer [(38)].

15. Data transmission network according to claim 1 [one of the preceding claims],
wherein the line termination device [(2)] comprises

a first storing means [(73)] for storing the AGC coefficients for the
network termination devices [(8)] connected to the line termination
device [(2)], and

a second storing means [(74)] for storing equalizer coefficients for the
network termination devices [(8)] connected to the line termination

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device [(2)].

16.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein the AGC coefficients of the selected network termination device selected by the selecting unit [~~(66)~~] are loaded into the AGC circuit [~~(32)~~] of the xDSL transceiver [~~(20)~~] of the line termination device [(2)].

17.   Data transmission network according to <u>claim 15</u> [~~one of the preceding claims~~], wherein the equalizer coefficients of the selected network termination device [~~(8)~~] selected by the selecting unit [~~(66)~~] are loaded into the equalizer [~~(38)~~] of the xDSL transceiver [~~(20)~~] of the line termination device [(2)].

18.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein the network termination device [~~(8)~~] comprises a grant decoder [~~(86)~~] for decoding messages within downstream data frames broadcasted by the line termination device [(2)].

19.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein the xDSL transceivers [~~(20)~~] are VDSL transceivers.

20.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein the impedances of the network termination devices [~~(8)~~] connected to the data transmission medium [~~(7)~~] are balanced.

21.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein eight network termination devices are connected via the data transmission medium [~~(7)~~] to the line termination device [~~(8)~~].

22.   Data transmission network according to <u>claim 1</u> [~~one of the preceding claims~~], wherein several line termination devices [~~(2)~~] are connected to a switch [~~(4)~~].

23.   Data transmission network according to <u>claim 22</u> [~~one of the preceding claims~~], wherein the switch [~~(4)~~] is connected to an IP backbone [~~(5)~~].

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24. Method for data transmission comprising [the following steps]:

[(a)] generating a data transmission request message by a network termination device [(8)] when the network termination device receives data from a connected data communication device [(9)];

[(b)] transmitting the generated data transmission request message within an upstream data frame via a data transmission medium [(7)] to a line termination device [(2)];

[(c)] selecting the network termination devices [(8)] depending on stored status information data of the network termination devices;

[(d)] generating data transmission grant messages for the selected network termination devices [(8)] by the line termination device [(2)];

[(e)] broadcasting downstream data frames containing the generated grant messages via the data transmission medium [(7)] to the connected network termination devices [(8)]; and

[(f)] transmitting data from the selected network termination device [(8)] after the grant message has been decoded.

25. Line termination device comprising

a selection unit [(66)] for selecting a network termination device [(8)] from a group of network termination devices connected to the line termination device [(2)] in response to a request message depending on stored status information data of the network termination devices;

a grant message generator for generating data transmission grant messages for the selected network termination device [(8)], and

an xDSL transceiver [(20)] for broadcasting downstream data frames

including the generated grant messages via a data transmission
medium [(7)] to the network termination devices [(8)].

26.   Network termination device comprising

a request message generator [(83)] for generating a data transmission
request message when a data communication device [(9)] connected to
the network termination device [(8)] is sending data, and

an xDSL transceiver [(20)] for transmitting an upstream data frame including the
generated request message via the data transmission medium [(7)] to a connected line
termination device [(2)].

In the abstract:

Data transmission network having a least one line termination device [(2)] connected via
a data transmission medium [(7)] to several network termination devices [(8)], each
network termination device [(8)] comprising a request message generator [(33)] for
generating a data transmission request message when a data communication device [(9)]
connected to the network termination device [(8)] is sending data, and an xDSL
transceiver [(20)] for transmitting an upstream data frame including the generated request
message via the data transmission medium [(7)] to the line termination device. [(2), said]
The line termination device [(2) comprising] includes a selection unit [(66)] for selecting
network termination devices [(8)] which have sent a request message depending on stored
status information data of the network termination devices [(8)], a grant message
generator [(68)] for generating data transmission grant messages for the selected network
termination devices [(8)], and an xDSL transceiver [(20)] for broadcasting downstream
data frames including the generated grant messages via the data transmission medium
[(7)] to the network termination devices [(8)].
[Fig. 2] --